

BAYOU POINTE AU CHIEN WATERSHED IMPLEMENTATION PLAN

Louisiana Department of Environmental Quality, NPS Unit



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1.0 INTRODUCTION

Section 303(d) of the federal Clean Water Act (CWA) requires that each state identify those waters within its boundaries not meeting water quality standards. The CWA also requires that states develop Total Maximum Daily Loads (TMDLs) for water bodies determined to be impaired. A TMDL is a model that determines the amount of a pollutant a water body can assimilate without violating water quality standards. The TMDL breaks out the total load between known point sources (such as waste water treatment plants) and nonpoint sources (such as agricultural runoff). Also included is a margin of safety to accommodate data uncertainties and model errors.

Bayou Pointe au Chien (subsegment 120605) was listed on the 1999 Modified Court Ordered Section 303(d) List. The suspected causes of impairment were low dissolved oxygen, nutrients and total fecal coliform. The Bayou was part of the 1999 ambient network monitoring program (Water Quality Modeling Section, 2006) and was listed in the 2002 305(b) Report and the 2004 and 2006 Integrated Reports. Pointe au Chien was found to be not supporting its designated uses of Primary Contact Recreation and Fish and Wildlife Propagation in 2002 and 2004. (In 2006, the Bayou was fully supporting its designated use of Primary Contact Recreation but still failing to support its use of Fish and Wildlife Propagation due to low levels of dissolved oxygen.) Because of its failure to support designated uses, a TMDL was developed for the Bayou.

Designated uses specific to Bayou Pointe au Chien are primary contact recreation, secondary contact recreation, and fish and wildlife propagation. Primary contact recreation (PCR) includes recreation such as swimming and water skiing. Secondary contact recreation (SCR) is other uses where body contact is incidental such as fishing and boating. Propagation of Fish and Wildlife (FWP) involves the protection of aquatic habitat, food, reproduction and travel corridors.

Year	Supporting Designated Uses (Yes/No)		
	PCR	SCR	FWP
1994	No	No	No
1996	No	No	No
1998	*	*	*
2002	No	Yes	No
2004	No	Yes	No
2006	Yes	Yes	No

* insufficient data

Table 1 Failure to meet Designated Uses

1.1 Terrebonne Basin Description

Bayou Pointe au Chien is located in the Terrebonne Basin. The Terrebonne Basin covers an area extending approximately 120 miles from the Mississippi River at Morganza on the north to the Gulf of Mexico on the south. The Basin is bounded on the west by the Atchafalaya River Basin and on the east by the Mississippi River and Bayou Lafourche. The Terrebonne Basin is entirely lowland and all the land is subject to flooding except for the natural ridges and levees along major waterways. The coastal portion is prone to tidal flooding and consists of marshes ranging from fresh to saline (Office of Water Resources, 1987). The Terrebonne Basin is crisscrossed with an extensive network of manmade canals and other altered waterways. Some water bodies have been hydro-modified to such an extent that they no longer function as nature intended. Today, their main purpose is drainage. The Terrebonne Basin, including the Pointe au Chien, has also been greatly affected by subsidence.

2.0 BAYOU POINTE AU CHIEN LAND USE

2.1 Pointe au Chien Watershed Description

The Bayou Pointe au Chien Watershed (subsegment 120605) is located in southern Louisiana, southwest of New Orleans, in Lafourche and Terrebonne Parishes, which it separates. Everything on the west side of the Bayou is in Terrebonne Parish; everything on the east side is in Lafourche. The water body may be an historic offshoot of Bayou Terrebonne, which is about a mile to the west.

The Bayou has undergone significant hydromodification. Today the headwaters of Bayou Pointe au Chien are an agricultural ditch running through forest and sugarcane fields (Water Quality Modeling Section, 2006). High water salinities prevent agriculture in most of the subsegment. Gas and oil extraction are prevalent. The wetlands and marshes of this subsegment and the rest of the Terrebonne Basin act as a buffer to help moderate flooding and tidal inundation during storm events. Erosion of the delta, land subsidence, and rising sea levels threaten the lower reaches of Bayou Pointe au Chien.



Figure 1 Saltwater fishing at the southern boundary of subsegment 120605 where it melds into the open marsh.

Bayou Pointe au Chien flows south where it runs alongside LA 665, passing through a small community and the Pointe au Chien Wildlife Management Area. At its southern end, it feeds into marsh and eventually the open waters of the Gulf. Most of the watershed is marsh, wetlands, and open water. There are no large towns. Bayou Pointe au Chien is approximately twenty-four and a half miles long. However, much of this in its southern extent is open water and not a discrete river channel.



Figure 2 Tackle shop and small inn located at the terminus of LA 665. LA 665 straddles a narrow spit of land that juts into the salt water before its sudden end.

Land Use Type	Acres	Percent of Total Area
Fresh Marsh	7231.16	25.82
Wetland Forest Deciduous	6412.97	22.9
Intermediate Marsh	4443.89	15.87
Water	3564.98	12.73
Agriculture/Cropland/Grassland	2879.79	10.28
Brackish Marsh	1983.54	7.08
Wetland Deciduous	760.81	2.72
Vegetated Urban	460.36	1.64
Upland Forest Mixed	170.35	0.61
Wetland Evergreen	39.59	0.14
Upland Forest Deciduous	32.69	0.12
Upland Mixed	22.68	0.08

Table 2 Land use in the Pointe au Chien (taken from the 2006 LDEQ TMDL)



Figure 3 Roadside sign seen on LA 665 is located near a LDWF field office in the watershed.

A great deal of subsegment 120605 is protected in the Pointe-au-Chien Wildlife Management Area (WMA). (The WMA crosses over into other subsegments as well.) Major attractions of the WMA include deer hunting, duck hunting, and fishing (Louisiana Department of Wildlife and Fisheries web site). The Pointe-au-Chien WMA consists of intermediate/brackish marsh with few upland areas.

The aim of the WMA is to maintain available marsh habitat, and enhance that habitat for waterfowl and other wildlife. Production of submerged aquatics such as grasses enhances the area for waterfowl. As for the less common upland tracts, there are long-range plans for reforestation (Louisiana Department of Wildlife and Fisheries web site).

Terrebonne Parish maintains a water control structure just west of LA 665 in a semi-urbanized area. Used for flood control, the pump station drains runoff into the brackish marsh of the WMA. The Barataria-Terrebonne National Estuary Program (BTNEP) sponsors a stormwater redirection project here. It is hoped that the infusion of fresh water may help decrease salinity levels and increase die-off of pathogenic bacteria in the WMA.



Figure 4 Terrebonne Parish Pump Station, located in the community of Pointe-au-Chien, drains runoff into the marsh of the WMA

Soils in the Pointe au Chien watershed are silt loam, clay and peat with a very slow infiltration rate, poor drainage and high runoff. Soil Erodibility, or K-factor, is a soil property that is defined as the ease with which soil is detached by a splash of rainfall, surface flow or both. It is related to the integrated effects of rainfall, runoff, and infiltration on soil loss. Soil erosion increases sediment runoff to waterways. Physical, chemical, and mineralogical soil properties, and their

interactions, affect K values. A high K-factor indicates an increased likelihood for soil erosion. K-factors in the watershed range from .012 through .3527 (Tetra Tech, 2006), meaning these soils are not as erodible as they might be.

There are periods of no-flow in the upper reaches of Bayou Pointe au Chien and these reaches may be completely dry at times. This channelized portion is dependent on runoff/discharge from agricultural and residential areas for flow. It also receives runoff from LA 665, which it parallels for several miles in its middle section. LDEQ staff was told that the headwater flow may be restricted by a weir further upstream



Figure 5 Looking west/southwest from the Terrebonne Parish Pump Station, freshwater runoff is discharged into the WMA. (Water Quality Modeling Section, 2006). The flow in Pointe au Chien may be wind-driven, like other waters in the Terrebonne Basin and it is subject to tidal influences in its southern portion. There may be zero and negative flow at times.



Figures 6 and 7 Bayou Pointe au Chien is a channelized roadside ditch in the mid reaches of the subsegment, running parallel to LA 665 in a residential area

2.2 Field Survey of the Pointe au Chien Watershed

Staff from the LDEQ Nonpoint Unit visited the watershed on April 9, 2008. “Point Au Chenes” is French for “Point of the Oaks”. “Chien” is French for “dog”. Alternate spellings are used throughout the watershed. There is one small settlement, the Pointe-au-Chien community. It sits along both sides of LA 665 and the bayou. Many of the occupants of this small village are Native American and members of the Pointe-au-Chien Indians. The main occupation is fishing. The community was severely impacted by the 2005 Hurricane Season. There was wind damage after Katrina and widespread flooding after Rita. Some lost their homes.

Neither Terrebonne nor Lafourche Parish has public community sewerage in this area. Except for a few isolated mobile home parks that may have small private community systems, residences in this area are connected to individual septic tanks, cesspools, or Aerobic Treatment Units. Although some of these may treat on-site, it is likely that some discharge to the Bayou.



Figures 8 and 9 The Pointe-au-Chenes Supermarket serves the small community. Many of the homes are elevated.

3.1 WATER QUALITY ANALYSIS

Water quality standards are developed to support each different type of designated use. Water quality standards for bacteria have been promulgated by the State in order to protect the water bodies as well as public health. These standards may be based upon fecal coliform bacteria, which may indicate the presence of other, potentially harmful microbes. Designated uses specific to Bayou Pointe au Chien are primary contact recreation, secondary contact recreation, and fish and wildlife propagation.

Primary contact recreation (PCR) includes recreation and other uses where there is prolonged body contact such as swimming and water skiing. Secondary contact recreation (SCR) is recreation and other uses where body contact is incidental such as fishing and boating. Failure to maintain PCR and SCR indicates that fecal coliform levels may be elevated in a water body.

Propagation of Fish and Wildlife refers to the protection of aquatic habitat, food, reproduction and travel corridors. A main criterion in determination of use attainment for FWP is the concentration of dissolved oxygen (D.O.). D.O. levels of 5 mg/L are the standard to support FWP. (This is also the year-round criterion for D.O. in this water body subsegment.)

Numerical Criteria	
Subsegment Number	120605
Water body Description	Bayou Pointe au Chien – Source to boundary between segments 1206 and 1207
Designated Uses	A, B, C
Criteria:	
Chlorides	445 mg/L
Sulfates	105 mg/L
DO	5.0 mg/L
pH	6.5 – 9.0
Temperature	32 °C
TDS	1000 mg/L
A- primary contact recreation; B- secondary contact recreation; C- propagation of fish and wildlife	

Table 2 Water quality standards for Pointe au Chien

Designated Uses for the Water body subsegment 120605				
Designated Use	Measured Parameter	Support Classification for Measured Parameter		
		Fully Supporting	Partially	Not Supporting
Primary Contact Recreation (PCR)	Fecal coliform ¹	0-25% do not meet criteria	-	>25% do not meet criteria
	Temperature	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
Secondary Contact Recreation (SCR)	Fecal coliform ¹	0-25% do not meet criteria	-	>25 % do not meet criteria
Fish and Wildlife Propagation (FWP)	Dissolved oxygen ²	0-10% do not meet minimum of 3.0 ppm and median > criteria of 5.0 ppm	-	>10% do not meet minimum of 3.0 ppm or median < criteria of 5.0 ppm
	Dissolved oxygen ³	0-10% do not meet criteria	>10-25% do not meet criteria	>25% do not meet criteria
	Temperature, pH, chloride, sulfate, TDS	0-30% do not meet criteria	>30-75% do not meet criteria	>75% do not meet criteria
1. For Bayou Pointe au Chien, criteria are as follows: PCR, 400 colonies/100 mL; SCR, 2,000 colonies/100 mL 2. Water bodies without a special study to establish specific criteria for D.O. 3. Water bodies for which a special study has been conducted to establish criteria for D.O.				

Table 3 Designated uses

3.1 Water Quality Test Results

There is one monitoring site in the watershed (Station 0946) located east of Montegut, Louisiana. Limited information is available. Data were collected in 2000, 2005 and 2006 for dissolved oxygen, dissolved oxygen percent saturation, and nitrate plus nitrite. Based on this information, oxygen levels have increased between 2000 and 2006. In the case of nitrate plus nitrite, most of the data were collected in 2000.

D.O. (mg/L) for the Pointe au Chien Watershed			
Month	2000	2005	2006
January	3.8	6.8*	5.0*
February	4.7	5.7	6.7
March	4.1	5.8*	5.4
April	4.6	4.6	6.1
May	3.0	5.1	5.2
June	2.6	4.4*	3.0
July	4.9	N/D	1.4
August	1.2	4.1*	N/D
September	3.7	N/D	4.8
October	3.5	N/D	2.2
November	3.5	N/D	4.5
December	5.7	N/D	6.9

* median of two data points; N/D = no data

Table 4 D.O. data for the Pointe au Chien

At present there are no specific numeric criteria for nutrients in Louisiana. However, the State currently has a narrative standard that states “The naturally occurring range of nitrogen-phosphorus ratios shall be maintained...Nutrient concentrations that produce aquatic growth to the extent that it creates a public nuisance or interferes with designated water uses shall not be added to any surface waters.”

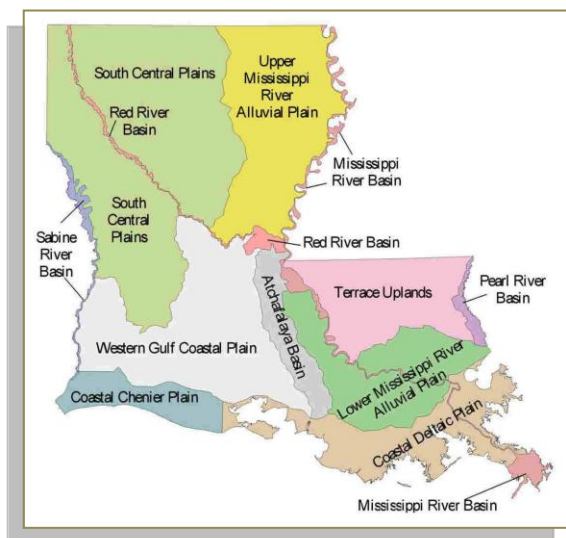


Figure 10 Louisiana Ecoregions

Louisiana has implemented an ecoregional framework to assess water quality and ecological conditions in least-disturbed streams (LDEQ web site). These least-disturbed streams are used as reference streams to assess other, similar water bodies in the same ecoregion. Ecoregions denote areas of similar ecological characteristics. Bayou Pointe au Chien lies within the Lower Mississippi Alluvial Plain and Coastal Deltaic Plain ecoregions.

The Lower Mississippi Alluvial Plain is mostly flat and subject to periodic flooding. Bottomland hardwood forests and cypress swamps are the dominant natural plant communities in the Mississippi River Alluvial Plain. The Coastal Deltaic Plain is dominated by brackish and saline marshes. Elevations are near sea level. Vegetation includes grasses (e.g.: *Spartina alterniflora*) and reeds. Live oak is found on some hummocks that rise out of surrounding marsh.

LDEQ has developed median nutrient values for the different ecoregions of the state. Median nitrogen values for the Lower Mississippi Alluvial Plain and Coastal Deltaic Plain are 1.21 mg/L and 1.11 mg/L, respectively. The very limited data collected at Station 0946 do not indicate a nitrogen problem in Bayou Pointe au Chien.

Nitrate + Nitrite Nitrogen (mg/L or ppm)* for the Pointe au Chien Watershed			
Month	2000	2005	2006
January	0.03	0.12**	N/D
February	0.06	0.08	0.06
March	0.02	0.06**	N/D
April	0.04	0	N/D
May	0.05	0	N/D
June	0.04	0	N/D
July	0.03	N/D	N/D
August	0.05	0	N/D
September	0.07	N/D	N/D
October	0.07	N/D	N/D
November	0.07	N/D	0.07
December	0.10	N/D	N/D

*mg/L and ppm are used interchangeably and are considered equivalent; **median of two data points; N/D = no data

Table 5 Nitrogen data for the Pointe au Chien

4.0 TMDL FINDINGS

The purpose of a TMDL is to determine the amount of a pollutant that a water body can assimilate without exceeding the water quality standard for that pollutant. A TMDL also establishes the load reduction that may be necessary to meet a given standard in a water body. A TMDL is the sum of the waste load allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The WLA is the load allocated to point sources/discrete dischargers and the LA is the load allocated to nonpoint sources/runoff. The MOS is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions and data inadequacies. [The TMDL for Fecal Coliform Bacteria also included a future growth (FG) component. This was set at ten percent of the load to account for future urban development, point sources, agriculture, etc.]

4.1 TMDL for Biochemical Oxygen Demanding Substances and Nutrients

The 2006 TMDL by LDEQ addressed biochemical oxygen-demanding substances and nutrients for the watershed. The TMDL survey was conducted in July 2003 under low flow conditions. The results of LDEQ's projection modeling for both summer and winter indicated that the water quality standard for DO can be maintained during the summer critical season with an 80 percent reduction of the total nonpoint biological oxygen demand (BOD) loading and the permit limit of 30 mg/L at the Pointe au Chien School (Water Quality Modeling Section, 2006).

Problems with low dissolved oxygen are often related to biochemical oxygen demand and nutrients. D.O. problems are generally at their worst during dry summer seasons. Low levels of dissolved oxygen diminish the

habitat value of a water body and may compromise the vitality of aquatic life, reducing its resistance to disease and causing other problems. Oxygen concentrations greater than 5.0 mg/L are most beneficial.

Excessive discharges of nitrogen and other nutrients are an important cause of low D.O. levels. Nitrogen fuels the growth of algae and aquatic plants. When these plants die, they settle to the bottom of the water body. Much decaying organic material is found in the benthic load, the accumulated layers of sediment that blanket the streambed. Here as it continues to decay, oxygen will be required for the biodegradation process. During periods of high temperature and low stream flow (frequent for Pointe au Chien), the benthic load has its greatest negative effect upon D.O. levels.

In the TMDL model, this die-off in the sludge layer was expressed as sediment oxygen demand (SOD). SOD is not associated with a flow. The LDEQ modelers found that SOD values were high in the discharge-driven upper reaches (that run through agricultural fields and one small community) and lower in the more southerly, deeper reaches (as the Pointe au Chien nears and becomes open marsh). A large portion of the SOD in the upper reaches is attributed to the die off of algae and macrophytes that exist in the upper reaches. SOD values declined sharply near the southern extent of the model (Water Quality Modeling Section, 2006).

4.2 TMDL for Fecal Coliform Bacteria

Tetra Tech, Inc. completed a 2006 TMDL addressing fecal coliforms. The TMDL was based on the 2004 impairment of primary contact recreation and fish and wildlife propagation and utilized data collected over several months in 2000. Suspected sources of fecal contamination included on-site treatment systems and wildlife such as nutria. The TMDL found that a 20% reduction in the summer months (May 1 – October 31) and no reduction in the winter months would be needed to maintain the standard for fecal coliforms.

Fecal coliform refers to a group of bacteria that is associated with the intestines of warm-blooded animals. It is generally monitored as an indicator of potential human health threats resulting from swimming. Testing for fecal contamination is one way to determine the presence of human and/or animal waste in a water body. Although the bacteria itself does not cause disease, a positive finding may indicate the presence of other pathogenic organisms that are harder to detect. Nonpoint sources of fecal contamination include wildlife, grazing livestock, land application of manure, pets, and failed septic systems. Louisiana has established a seasonal water quality standard for bacteria based upon definition of a summer swimming season and winter secondary contact only.

Louisiana's water quality standard for protection of the primary contact recreation use reads as follows:

"No more than 25 percent of the total samples collected on a monthly ... basis shall exceed a fecal coliform density of 400/100mL. This primary contact recreation criteria shall apply only during the defined recreational period of May 1 through October 31. During the non-recreational period of November 1 through April 30, the criteria for secondary contact recreation shall apply."

The standard for secondary contact recreation reads similarly:

"No more than 25 percent of the total samples collected on a monthly ... basis shall exceed a fecal coliform density of 2,000/100 mL. This secondary contact recreation criterion shall apply year round"

5.0 IDENTIFICATION OF HIGH PRIORITY AREAS

The map developed by the LDEQ GIS Center shows subsegment 120605, the Pointe au Chien. The urban areas shown are the outlying parts of Houma and the town of Montegut. The small community of Pointe-au-Chien does not appear. One can see how rapidly the watershed gradates into wetland, marsh and open water. From a total of approximately 28,172 acres for the watershed, around 4,671 acres (comprising Bare Field, Deciduous Forest, Pasture, Sugarcane, and Urban/Developed) may be habitable. This is around 15% of the total subsegment area or a little over seven square miles. Land uses of greatest concern in the Pointe au Chien watershed are sugarcane cultivation and urban/residential.

6.0 SOURCES OF NONPOINT SOURCE POLLUTION LOADING

Agriculture

The Pointe au Chien water body today is a series of manmade canals that run through sugarcane fields and pasture lands in its northern extent. All manner of agricultural runoff may impact the Pointe au Chien as the Bayou was designed, in part, to provide drainage to the low-lying arable land and may also aid irrigation. (The Bayou does not presently run through its natural channel. It has been hydromodified throughout its extent. The channelized waterway of today was utilized in the LDEQ TMDL Model.) Pollutants associated with sugarcane production include sediment, pesticides, nitrogen and phosphorus.

Point Source Discharges

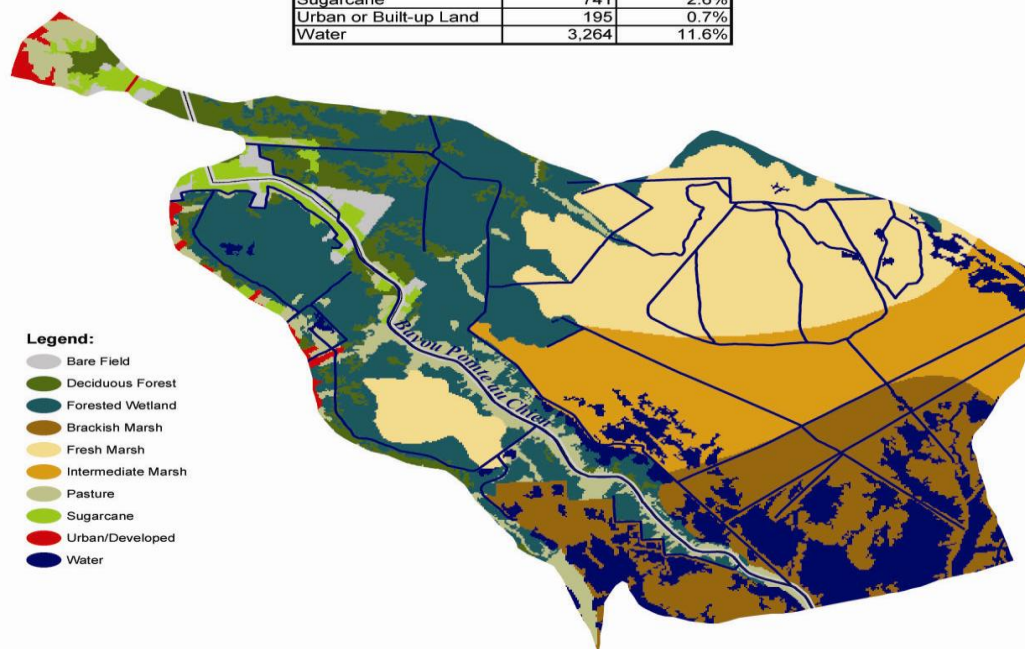
The LDEQ TMDL document identifies the Pointe au Chien School as discharging into the watershed. The School discharges directly to the Bayou. Since TMDL development (TMDL survey data were collected in 2003), H's Corner Stop has become permitted to discharge sanitary wastewater to the Bayou. Therefore, H's Corner Stop was not included in development of LDEQ's TMDL.

Because the survey data for the Biochemical Oxygen Demanding Substances and Nutrients TMDL were collected in July 2003, no discharge was occurring at the school and no discharge data were collected. This does not eliminate the possibility that discharge from the school may have an impact. This discharge may at times drive flow during low flow conditions. Either or both of these dischargers may be a potential source of nonpoint source pollution in the Pointe au Chien waterway.

2005 Land Use / Land Cover for Bayou Pointe au Chien LDEQ Basin Subsegment 120605



Land Use/Land Cover	Acres	Percentage
Bare	368	1.3%
Brackish Marsh	3,766	13.4%
Deciduous Forest Land	1,549	5.5%
Forested Wetland	6,206	22.0%
Fresh Marsh	5,810	20.6%
Intermediate Marsh	4,455	15.8%
Pasture/Hay	1,818	6.5%
Sugarcane	741	2.6%
Urban or Built-up Land	195	0.7%
Water	3,264	11.6%



Legend:

- Bare Field
- Deciduous Forest
- Forested Wetland
- Brackish Marsh
- Fresh Marsh
- Intermediate Marsh
- Pasture
- Sugarcane
- Urban/Developed
- Water



Terrebonne Basin

Date: August 31, 2006
Map Number: 200601829
Projection: UTM Zone 15, NAD 1983
Sources: LDEQ 2005 Terrebonne Basin Land Use Classification,
LDWF & NBS 2001 Louisiana Coastal Marsh-Vegetative Type Map,
LOSCO 2004 TIGER/Line Hydrographic Polygons for Louisiana,
LOSCO 2004 TIGER/Line Places for Louisiana,
LDEQ 2004 Basin Subsegments,
ESRI GDT Streams, GDT roads, LDDOT Parish Boundaries



The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, which are of varying degrees of map accuracy. Therefore, LDEQ cannot guarantee the accuracy of this map or data set, and does not accept any responsibility for the consequences of its use.

Figure 11 Subsegment 120605

Hydromodification

Hydrologic modifications are defined as those activities which are designed to affect natural stream flow. These types of modifications include bank stabilization, channel alignments, dredging, locks and dams, levees, spillways, and impoundments. Dredging, channel modifications, and impoundments are contributors to the nonpoint source pollution problem. These activities may be conducted for navigation, flood control and irrigation. A permit program, administered by the United States Army Corps of Engineers, oversees many of these modifications. All hydrologic modification has the potential to cause water quality problems. Although no dredging was seen by LDEQ, the possibility of its occurrence is likely. Dredging was seen in nearby water bodies not included in subsegment 120605.

Pointe au Chien has been heavily channelized as has most of the Terrebonne Basin. The Bayou is not in its original stream bed but now flows through a series of ditches. Its northern beginnings in agricultural lands are not likely the original headwaters. Its mid-reaches are a roadside drainage canal that parallels LA 665 for much of its extent. At its southern end, Bayou Pointe au Chien widens and becomes indistinguishable from the surrounding marsh.

Erosion

There are strategies to mitigate the effects of erosion in channelized water bodies, such as the Pointe au Chien. Erosion may occur due to soil type, tidal influence or other factors not caused by human influence. Soil erosion generally is not a serious problem on most of the soils in Pointe au Chien. Most of the topography is level or nearly level. In its mid-reaches, much of the mid-Pointe au Chien is covered in lawn grass and the effects of erosion are blunted here. The lower reaches of the water body are estuarine and open water and less subject to erosion.

Erosion is most likely to occur in the agricultural fields found in the upper reaches of the water body. Sheet and rill erosion can be moderately severe in fallow, plowed fields and in newly constructed drainage ditches. Some gullies tend to form at outfalls into drainage areas. Several conservation measures exist that have demonstrated a positive effect on erosion problems. When efforts are made to mitigate other pollutants such as nitrogen and bacteria, excess sediment is frequently curbed.

7.0 NONPOINT SOURCE POLLUTION SOLUTIONS

While there is little development of any kind in the Pointe au Chien watershed, some potential areas exist that might benefit from Best Management Practice (BMP) implementation. BMPs are defined as “practices, techniques, and measures that prevent or reduce water pollution from nonpoint sources by using the most effective and practicable means of achieving water quality goals” (Minnesota Pollution Control Agency). A small settlement and agriculture fields are concentrated along the main highway in the northern and middle parts of the watershed. Several BMPs have been developed that address potential concerns.

Nutrients

Excessive plant growth, including nuisance species, may sometimes be seen in Bayou Pointe au Chien. The water body runs through sugarcane fields and green lawns on its way to the Gulf of Mexico. While the water quality data cited previously did not show elevated nitrogen to be a concern in the Bayou, these data are limited and not conclusive. Visual observation indicates that nutrient loading might be high. The United States Department of Agriculture (USDA) has assessed the effectiveness of the following measures in addressing nutrients from sugarcane runoff.

SUGARCANE BEST MANAGEMENT PRACTICES ¹ – Nutrient Concerns in Surface Water				
PROBLEM: Excess nitrogen and phosphorus in a water body cause excessive plant and algal growth, and imbalance of natural nutrient cycles, and a decline in the number of desirable fish species. High nitrate levels can be hazardous to warm-blooded animals under conditions that are favorable to reduction to nitrite.				
PROCESSES: Runoff of soluble nitrogen and phosphorus in water and movement of nitrogen and phosphorus combined with soil and organic matter from site.				
CAUSES: Excess amounts of surface-applied nitrogen and phosphorus, runoff water and interflow, improperly managed irrigation systems, and erosion of soil and organic wastes.				
	Effectiveness of Favorable BMPs for:		Practices which may Be unfavorable ³ :	
Favorable BMPs ²	Soluble N.	Adsorbed N.		
Nutrient management	substantial	substantial	Land clearing	
Waste utilization	slight	moderate	Subsurface drainage ⁵	
Irrig. Water mgt. ⁴	slight	substantial	Subsurface drain ⁵	
Tailwater rec. ⁴	slight	moderate		
Land leveling ⁴	slight	moderate		
Irrig. System ⁴	slight	substantial		
Field border ⁷	slight	moderate		
Cover crop	slight	moderate		
Deep tillage	slight	substantial		
Cons. Crop. rot.	slight	moderate		
Ridge till	slight	slight		
Crop residue, seasonal	slight	slight		
Filter strips/buffers ⁷	substantial	substantial		
Grassed waterway ⁶	slight	moderate		
(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed. (2) This list is not ranked in an order, which would indicate preference in installation. (3) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed. (4) Irrigated fields. (5) Where water table control or regulating water in drainage systems is not applied. (6) Chemical maintenance of vegetation may adversely affect the quality of runoff water. (7) Fields not artificially drained.				

Table 6 Sugarcane Best Management Practices for Nitrogen

Conservation tillage and use of cover crops are two popular BMPs in south Louisiana sugarcane fields. They have proven to be effective in decreasing nitrogen levels in runoff water. Also, residue from sugarcane left on

the fields may help to maintain the organic matter content of the soils. In the Pointe au Chien watershed, three crops of sugarcane are generally obtained from each planting. After the third crop, the field may be planted to soybeans, a cover crop. Where the field is left fallow for a year, organic matter content of the soil may be maintained by leaving residue on the fields (USDA, 2001).

Filter strips are an effective practice for all manners of nonpoint pollution problems, including capturing nutrients and sediments in agriculture runoff. Filter strips may be grassy swales, native plants or other vegetation as well as mechanical barriers. Sediment, organic material, and nutrients may be “trapped” in the filter and drop out of runoff waters.

Bacteria

High levels of fecal coliforms have also been a problem in the watershed. The Bayou has been cited for this in the past. Dissolved oxygen levels remain depressed in the Pointe au Chien. USDA has evaluated the following practices to address these concerns as elevated levels of bacteria may arise from sugarcane fields. When viewing the table below, it should be remembered that the Pointe au Chien is the irrigation system for these fields.

SUGARCANE BEST MANAGEMENT PRACTICES ¹ – Organic Matter & Bacteria Concerns in Surface Water			
PROBLEM: Animal Waste and crop debris is the major organic pollutant resulting from agricultural activities. They place an oxygen demand on receiving waters during decomposition, which can result in stress or the death of fish and other aquatic species. Certain bacteria can cause disease in humans such as infectious hepatitis, typhoid fever, dysentery, and other forms of diarrhea.			
PROCESSES: Movement of organic waste, bacteria, and organic matter in soil from the site and excess irrigation water.			
CAUSES: Over-application of waste or irrigation water, application of waste on unsuitable sites, improper timing of waste or irrigation application, and storm runoff.			
	Effectiveness of Favorable BMPs for:		Practices which may Be unfavorable ³ :
Favorable BMPs ²	O ₂ Demand	Bacteria	
Waste utilization	slight	neutral	Surface drainage ⁵
Irrig. System ⁴	slight	slight	Subsurface drain ⁵
Irrig. Water mgt. ⁴	slight	substantial	Land clearing
(1) There are many other practices not listed in this table which may be considered for installation for a specific purpose or as a part of a total resource management system which may increase or decrease loading or have little or no effects on water quality on a site-specific basis. An on-site analysis should be a consideration in evaluating the effect of a practice not listed. (2) This list is not ranked in an order, which would indicate preference in installation. (3) An on-site evaluation should be conducted to determine if conditions exist which would result in unfavorable effects if the practice was installed. (4) Irrigated fields. (5) Where water table control or regulating water in drainage systems is not applied.			

Table 7 Sugarcane Best Management Practices for Oxygen and Bacteria

Some portion of elevated bacteria levels in Pointe au Chien may be attributed to home sewerage. There are numerous rural residences in the watershed and none of these homes is connected to municipal sewage

treatment facilities. This lack of central sewage treatment may have caused a decline in water quality. Current records on individual treatment systems are incomplete or non-existent.

Actions recommended by LDEQ to mitigate the negative effects of home sewerage are found in Louisiana's Nonpoint Source Management Plan, Volume 6 (2000). These include:

- Work with the Louisiana Department of Health and Hospitals (LDHH) on programs to support improved inspection programs for home sewerage systems;
- Work with LDHH on educational materials that can improve the statewide education program for home sewerage systems;
- Support the incorporation of the results of these inspection programs into a comprehensive database on home sewerage systems; and
- Continue to seek and evaluate new, more effective technologies for individual home sewerage systems.

LDEQ has worked with Louisiana State University (LSU) for a number of years on the development and implementation of a Marshland Upwelling System (MUS). The MUS is an innovative on-site sewage system designed for success in the coastal region. Its developer has described the treatment system as using the soils within a saltwater marsh as a "sand filter". It is for use in areas with loose soils of low clay content and a highly saline water table. The MUS system will not work in areas with greater than 6 – 8 % clay content (Rusch, 2004). Although the ground water is of sufficient salinity in the watershed to support the MUS, soil texture may limit the system's use. On the highest ridges of the watershed, where homes and camps are found, silty loams dominate. These loamy soils have varying concentrations of clay and some are more tightly packed than others. Judgment may be made on a case-by-case basis.

8.0 MAKING THE IMPLEMENTATION PLAN WORK

8.1 Regulatory Authority

Section 319 of the Clean Water Act (PL 100-4, February 4, 1987) was enacted to specifically address problems attributed to non-point sources of pollution. Its objective is to restore and maintain the chemical, physical, and biological integrity of the nation's waters (Sec. 101; PL 100-4). Section 319 directs the governor of each state to prepare and submit a non-point source management program for reduction and control of pollution from non-point sources to navigable waters within the state by implementation of a four-year plan, submitted within 18 months of the day of enactment (LDEQ, 2000).

In response to the federal law, the State of Louisiana passed the Revised Statute 30:2011, which had been signed by the Governor in 1987, as Act 272. Act 272 designated the Louisiana Department of Environmental Quality (LDEQ) as the Lead Agency to develop and implement the State's Non-point Source Management Plan. LDEQ's Office of Water Resources (OWR) was charged with the responsibility to protect and preserve the quality of waters in the State and developed the non-point source management program, ground water quality program and a conservation and management plan for estuaries. These programs and plan were developed in coordination with the appropriate State agencies such as the Department of Natural Resources, the Department

of Wildlife and Fisheries, the Department of Agriculture and Forestry and the State Soil and Water Conservation Committees in various jurisdictions (La.R.S. 30:20). LDEQ's Office of Water Resources is therefore responsible for receiving federal funds to ensure clean water, providing matching State funds when required and complying with terms and conditions necessary to receive federal grants.

The water quality standards are described in LAC 33:IX.1101.D in chapter 11 (LDEQ, 2003). These standards are applicable to surface waters of the state and are utilized through the waste load allocation and permit process to develop effluent limitations for point source discharges to surface waters of the State. The water quality standards also form the basis for implementing the best management practices for control of non-point sources of water pollution.

Chapter 11 also describes the anti-degradation policy (LAC 33:IX.1109.A.2) which states that the administrative authority will not approve any wastewater discharge or certify any activity for federal permit that would impair water quality or use of state waters. Waste discharges must comply with applicable state and federal laws for the attainment of water quality goals. Any new, existing, or expanded point source or non-point source discharging into state waters, including land clearing, which is the subject of a federal permit application, will be required to provide the necessary level of waste treatment to protect state waters as determined by the administrative authority. Further, the highest statutory and regulatory requirements shall be achieved for all existing point sources and best management practices (BMPs) for non-point sources. Additionally, no degradation shall be allowed in high-quality waters that constitute outstanding natural resources, such as waters of ecological significance as designated by the office. Those water bodies presently designated as outstanding resources are listed in LAC 33:IX.1123.

8.2 Actions Being Implemented by LDEQ

The LDEQ is presently designated the lead agency for implementation of the Louisiana Nonpoint Source Program. The LDEQ Nonpoint Source Unit provides USEPA §319(h) funds to assist in implementation of BMPs and to address water quality problems in subsegments listed on the §303(d) list or those subsegments which are located within Category I Watersheds as identified under the Unified Watershed Assessment of the Clean Water Action Plan. USEPA §319(h) funds are utilized to sponsor cost sharing, monitoring, and education projects. These monies are available to all private, for profit, and nonprofit organizations that are authenticated legal entities, or governmental jurisdictions including: cities, counties, tribal entities, federal agencies, or agencies of the State. Presently, LDEQ is cooperating with such entities on nonpoint source projects throughout the state.

LDEQ presently has no active projects in the watershed itself. However, the Louisiana Nonpoint Program has directed many of its past and present efforts toward home sewage and sugarcane production. The Nonpoint Program has worked with universities to quantify runoff from sugarcane fields, develop reduced-tillage cultivation practices and new methods for managing sugarcane combine-harvest residue, and to educate sugarcane producers about the benefits derived from applying best management practices for commercial sugarcane production. The Program has also worked with local governments to inspect home sewage systems, fund parish sanitarians to conduct inspections, and educate homeowners about the need for routine maintenance and proper operation. All of these activities may have application in the Pointe au Chien watershed.

8.3 Actions Being Implemented by Other Agencies

Barataria-Terrebonne National Estuary Program

In 1990, USEPA and the state of Louisiana formed a partnership to protect and improve the water quality and habitat within the Barataria-Terrebonne estuary complex. This partnership resulted in the creation of BTNEP as one of the nation's 28 estuaries of national significance, which comprise EPA's National Estuary Program. BTNEP has done much to work with local citizens and educate the public on issues of concern. BTNEP is presently implementing a storm water redirection project in the small community of Pointe-au-Chien. Here, runoff is re-directed into the adjacent wetlands of the WMA to nourish the marsh.

Natural Resources Conservation Service

NRCS is an agency of the United States Department of Agriculture that assists landowners, communities and conservation districts in resource stewardship. NRCS has been a long-time partner of the Louisiana Nonpoint Program and has an active presence in Terrebonne and Lafourche Parishes. Three of its popular programs are EQIP (Environmental Quality Incentives Program), WHIP (Wildlife Habitat Incentives Program), and WRP (Wetland Reserve Program).

Louisiana Department of Agriculture and Forestry

LDAF partners with Louisiana Department of Environmental Quality to manage funds awarded under the CWA Section 319. LDAF, in turn, cooperates with NRCS and local Soil and Water Conservation Districts (SWCDs) to address issues with local producers. The Pointe au Chien watershed lies within the Lafourche-Terrebonne Soil and Water Conservation District.

Louisiana Department of Health and Hospitals

LDHH is the lead agency for home sewage oversight in the state of Louisiana. Parish sanitarians oversee such matters in Terrebonne and Lafourche Parishes through the LDHH Office of Public Health.

8.4 Implementation and Maintenance

Louisiana Department of Agriculture and Forestry maintains information on the costs of BMP installation. Listed below are some practices that may be helpful in the Bayou Pointe au Chien watershed. Within a BMP, there may be multiple variations, ranging in price, complexity and materials. These shown are only a starting point. Many of these practices are eligible for funding under various government programs.

Practice Code	Practice Name	Component	Unit	2008 Average Cost (\$)
100	Comprehensive nutrient mgt. plan	Comprehensive nutrient management plan	Flat rate	350.00
329	Residue and tillage management	No Till/Strip Till/Direct Seed	Flat rate	25.00
340	Cover crop	Establishment of seasonal cover crop	Flat rate	20.00
344	Residue management	Crop residue management (seasonal)	Flat rate	7.50
350	Sediment basin	Sediment basin (installed, mobilization, earthwork, outlet structure)	acre	2.45
386	Field border	Native species, 3 or more species mix (seedbed prep, seed, planting)	acre	150.00
393	Filter strip	Native species, 3 or more species mix (seedbed prep, seed, planting)	acre	150.00
393	Filter strip	Earthwork (smoothing, shaping, and mobilization)	cubic yard	1.64
449	Irrigation water management	Flowmeter (meter and installation of irrigation pipeline, per inch of pipe)	acre	81.00
590	Nutrient management	Precision Agriculture – with Yield Monitor	acre	36.00

Table 8 Costs of Best Management Practices

9.0 TIMELINE FOR IMPLEMENTATION

9.1 Tracking and Evaluation

The Integrated Report [305(b) and 303(d)] provides information on which water bodies are impaired or not in full support of their designated uses. The Integrated Report is a summary of the water quality status for each of the water bodies throughout the state. Those listed, impaired water bodies are then scheduled for TMDL development. Water bodies can be delisted, or removed from the 303(d) list, because new data indicate that the water body is meeting its designated uses. It has been seen that Pointe au Chien was delisted for Secondary Contact Recreation in 2002 and Primary Contact Recreation in 2006. Data collected by LDEQ indicated that those standards came into attainment.

Since 2004, LDEQ collects data on a four-year rotation of active monitoring sites. (Prior to 2004, data were collected on a five-year rotation.) These findings are used to compile the biennial Integrated Report. Based on the Integrated Report, there has been some success in Pointe au Chien. As of 2006, only Fish and Wildlife Propagation was failing to meet standards, a measure of low D.O. Bacteria levels were low enough in the water body for other standards to be met.

It is the objective of LDEQ to reduce the nonpoint source pollutant loads that are calculated for the Terrebonne River Basin. The goal is water quality improvement and restoration of designated uses. The four-year basin cyclic water quality-monitoring program will be the basis for tracking reduced pollutant loading.

Some guidelines for tracking and evaluation include:

- Work with BTNEP and other cooperating agencies and entities to target 303(d) listed water bodies in the Terrebonne Basin;
- Work with federal, state and local partners to plan the management strategies that should be implemented to reduce these pollutant loads;
- Determine whether additional steps are needed to reduce nonpoint source pollution from each of the land-use categories identified as contributing to loss of designated uses; and
- Continue to implement management strategies and monitor their effectiveness until water quality standards are met and designated uses are restored.

10.0 SUMMARY OF THE WATERSHED IMPLEMENTATION PLAN

Bayou Pointe au Chien was listed on the 1999 Modified Court Ordered Section 303(d) List and subsequently, TMDLs for fecal coliforms and D.O. were developed. It was found that reductions would be necessary to meet water quality standards. Bayou Pointe au Chien serves primarily as local drainage (Water Quality Modeling Section, 2006) and it may be that the DO standard will be hard to achieve. Most of the water body is shallow with little to no flow. The Bayou has been altered to the extent that it no longer functions as a natural waterway.

Unfortunately there are a lack of data and it is difficult to draw any determination from the limited information available. There is the additional problem of a lack of flow in the upper reaches. When present, this flow is overwhelmingly discharge-driven. With only two permitted dischargers reported, the important role of nonpoint source pollution in water quality becomes apparent.

Problem areas in the Pointe au Chien would be those that support agriculture and residences. Strategies that may be effective would address sugarcane cultivation, urban runoff, and home sewage system maintenance and improvement. Because the water body is somewhat insular, having been hydromodified to the extent that it no longer connects with its headwaters, there may be a unique opportunity to show improvement. For most of its extent, the Pointe au Chien flows independently and does not connect with other surface waters until it reaches open marsh near its southern boundary. Factors outside the subsegment are less likely to impact the Pointe au Chien than would be true in other, more naturally interconnected, subsegments. Also, its small size and land area make implementation less expensive and perhaps a more attainable objective than might be true elsewhere.

It may be useful to target home treatment systems in the small community of Pointe au Chien. While there is no evidence that home treatment systems are under-performing, LDEQ may still spearhead efforts to educate locals about home septic systems and offer financial assistance should an upgrade be in order. Literature and information is available to distribute to local residents and DHH sanitarians.

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APPENDIX

Timeline for Watershed Implementation

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
MERMENTAU	Dark Grey	Blue	Green	Green	Green	Dark Grey	Yellow	Yellow	Yellow	Yellow	Dark Grey	Blue	Blue	Blue	Blue	Dark Grey	Blue	Blue	Blue
Vermilion	Dark Grey	Blue	Green	Green	Green	Dark Grey	Yellow	Yellow	Yellow	Yellow	Dark Grey	Blue	Blue	Blue	Blue	Dark Grey	Blue	Blue	Blue
Calcasieu	Light Grey	Dark Grey	Blue	Blue	Blue	Green	Dark Grey	Yellow	Yellow	Yellow	Yellow	Dark Grey	Blue	Blue	Blue	Blue	Dark Grey	Blue	Blue
Ouachita	Light Grey	Dark Grey	Blue	Blue	Blue	Green	Dark Grey	Yellow	Yellow	Yellow	Yellow	Dark Grey	Blue	Blue	Blue	Blue	Dark Grey	Blue	Blue
Barataria	Light Grey	Light Grey	Dark Grey	Light Grey	Blue	Blue	Blue	Green	Dark Grey	Green	Yellow	Yellow	Dark Grey	Yellow	Blue	Blue	Blue	Dark Grey	Blue
Terrebonne	Light Grey	Light Grey	Dark Grey	Light Grey	Light Grey	Blue	Blue	Dark Grey	Blue	Blue	Green	Green	Dark Grey	Yellow	Yellow	Yellow	Yellow	Dark Grey	Blue
Pontchartrain	Light Grey	Light Grey	Light Grey	Dark Grey	Light Grey	Light Grey	Light Grey	Light Grey	Dark Grey	Light Grey	Blue	Blue	Blue	Blue	Dark Grey	Green	Green	Green	Yellow
Pearl	Light Grey	Light Grey	Light Grey	Dark Grey	Light Grey	Light Grey	Light Grey	Light Grey	Dark Grey	Blue	Blue	Blue	Green	Green	Dark Grey	Yellow	Yellow	Yellow	Dark Grey
Red	Light Grey	Light Grey	Light Grey	Light Grey	Dark Grey	Light Grey	Light Grey	Light Grey	Blue	Blue	Dark Grey	Green	Green	Green	Yellow	Dark Grey	Yellow	Yellow	Blue
Sabine	Light Grey	Light Grey	Light Grey	Light Grey	Dark Grey	Light Grey	Light Grey	Light Grey	Blue	Blue	Dark Grey	Green	Green	Green	Yellow	Dark Grey	Yellow	Yellow	Blue
Mississippi	Light Grey	Light Grey	Light Grey	Dark Grey	Light Grey	Light Grey	Light Grey	Light Grey	Dark Grey	Blue	Blue	Blue	Blue	Blue	Dark Grey	Green	Green	Yellow	Dark Grey
Atchafalaya	Light Grey	Light Grey	Light Grey	Light Grey	Dark Grey	Light Grey	Light Grey	Light Grey	Light Grey	Blue	Dark Grey	Blue	Blue	Green	Green	Dark Grey	Yellow	Yellow	Yellow

- 1- Dark Grey = Collect Water Quality Data to Develop the Total Maximum Daily Loads (TMDLs)
- 2- Turquoise = Develop the Total Maximum Daily Load for the Watersheds on the 303(d) list
- 3- Green = Develop Nonpoint Watershed Restoration Action Strategies
- 4- Yellow = Implement Nonpoint Watershed Restoration Action Strategies
- 5- Light Grey = Determine Whether Actions Have Been Successful in Restoring Designated Uses
- 6- Blue = Develop and Implement Additional Corrective Actions Necessary to Restore Designated Uses to the Water Body